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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/472,018	12/27/1999	YOSHIMASA FUJITA	900-312	8225

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EXAMINER
ROY, SIKHA

ART UNIT	PAPER NUMBER
2879	7

DATE MAILED: 07/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/472,018	FUJITA ET AL.	
	Examiner	Art Unit	
	Sikha Roy	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 July 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

The Amendments, filed on May 1 2002 and July 9 2002, have been entered and are acknowledged by the Examiner.

Cancellation of claim 2 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims12-17 are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent 6,013,384 to Kido et al. ('384)

Regarding claims 12,14 and 16 Kido et al.('384) disclose (Fig. 1 column 3 lines 20-51) an organic electroluminescent element comprising a substrate, proceeding from the substrate outwardly an anode, hole transport (hole injection) layer, an electron injection restraining (hole transport) layer a light emitting layer, a hole injection restraining (electron transport) layer, an electron transporting layer with electron

transporting material and inorganic donor (metal doped layer) and a cathode. The recitation of 'wherein the hole injection restraining layer restrains injections of holes from the light emitting layer into the electron transporting layer' is a functional recitation and has not been given patentable weight.

Referring to claims 13, 15 and 17 Kido et al.('384) disclose (column 4 lines52,53 column 5 lines 4,5)hole injection restraining layer (electron transport layer) can be formed of quinacridone and its derivatives thereof.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1,4, 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,858,562 to Utsugi et al. in view of JP 04297076 to Takashi.

Utsugi et al. disclose (column 4 lines 58-67) an organic thin film electro-luminescence device comprising an anode, a hole transporting layer in contact with the anode, an electron injection restraining (a potential barrier) layer in contact with the hole transport layer, a light emission layer in contact with the potential barrier layer and a cathode in contact the light emission layer. The electron injection restraining layer

(potential barrier layer) secures a sufficiently high degree of confinement of electrons, in the light emission layer ensuring a high probability of recombination of holes and electrons in the light emission layer (column 3 lines 51-58). Utsugi et al. further disclose (column 8 lines 64-67) an electron injection layer provided between the cathode and the light emission layer. Utsugi et al. further disclose (column 4 lines 60-67) that the potential barrier layer in contact with the hole transport layer have energy band gap higher than the energy band gap of the hole transport layer and the light emission layer in contact with the potential barrier layer has energy band gap smaller than that of barrier layer. Hence the electron affinity Ea^{A} of the hole transporting layer with the electron acceptor and the electron affinity Ea^{EM} of the light emission layer both are intrinsically greater than (or equal to) electron affinity Ea^{EBL} of the electron injection restriction layer in between.

$$|Ea^{A}| \geq |Ea^{EBL}| \text{ and } |Ea^{EM}| \geq |Ea^{EBL}|$$

Claim 1 differs from Utsugi et al. in that Utsugi et al. do not exemplify on the acceptor in the hole transporting material.

Takashi in analogous art of organic EL element discloses (please see the English abstract) hole transporting layer 3 in contact with the anode doped with acceptor and the electron injecting layer 5 doped with donor. It is to be noted that the acceptor increases the conductivity of the layer and hence increases the efficiency of luminance of the device.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to modify the hole transporting layer of the electroluminescent element of Utsugi et al. by the hole transporting layer with acceptor as taught by Takashi for increasing the efficiency of luminance of the electroluminescent element.

Referring to claim 4, Utsugi et al. disclose (column 3 lines 35-38, column 77 lines 18,19) the electron injection restraining (potential barrier) layer comprising of N, N'-diphenyl-N, N'-bis-(3-methylphenyl)-[1,1'-biphenyl]-4 which constitute hole transporting material.

Referring to claim 6, Utsugi et al. disclose (column 112 lines5-7) the electron injection restriction (potential barrier) layer has a thickness not more than 10nm.

Referring to claim 10 Utsugi et al. disclose (column 4 lines 58-67) an organic electroluminescent device consisting of an organic thin film electroluminescent element with anode, hole transporting layer, electron injection restraining layer (potential barrier layer), light emitting layer and cathode arranged in order from anode to cathode.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,858,562 to Utsugi et al. in view of JP 04297076 to Takashi and further in view of U. S. Patent 5,256,945 to Imai et al.

Imai et al. in relevant art of electroluminescence element disclose (abstract) a second hole transporting layer in contact with anode formed of organic compound having cyano group, nitro group. The cyano and nitro group acting as acceptor

increases conductivity, thereby decreasing voltage and hence improves the durability of the organic EL element (column 7 lines 50-56).

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to specify the cyano group as the acceptor or doping material for the hole transporting layer of Takashi as suggested by Imai et al. for improving the light emission and durability of the organic EL element.

Claims 3,5,7, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,858,562 to Utsugi et al. in view of JP 04297076 to Takashi and further in view of U. S. Patent 5,869,199 to Kido ('199).

Referring to claims 3,5,7,9 Utsugi et al. and Takashi do not exemplify the hole injection restraining layer on the electron transporting layer and in contact with the light emission layer.

Regarding claim 5 Kido('199) in relevant art of organic electroluminescent elements disclose (column 3 lines 55-63) electron transporting material with electron transport properties and superior hole-blocking properties. Kido('199) further discloses (column 4 lines 15,16) that 1,2,4-triazole derivative is excellent in both electron transport properties and hole blocking properties and hence the hole injection restraining layer is constituted by electron transport material. It is noted that this layer with hole injection restraining (hole blocking) layer increases the efficiency of recombination of electrons and holes in the light emission layer because of containment of excitons generated by the combination of electrons and holes, thus contributing a further increase in luminous efficiency, luminance of the luminescent layer and stability accompanied thereby.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to modify the electron injection layer of Utsugi et al. and Takashi by adding another hole blocking layer as suggested by Kido ('199) for increasing the luminous efficiency of the organic EL element.

Referring to claim 3, the ionization potential of the light emission layer Ip^{EM} and that of the donor Ip^{D} are intrinsically less than the ionization potential of the hole blocking layer Ip^{HBL} in between so that the electrons will be transported and combined in the light emission layer.

$$|Ip^{D}| \leq |Ip^{HBL}| \text{ and } \quad |Ip^{EM}| \leq |Ip^{HBL}|$$

Referring to claim 7, Kido ('199) discloses (column 7 lines 53-60) the thickness of the hole blocking (derivative layer) layer is about 10 –20 nm.

Referring to claim 9, Kido ('199) discloses electron transport layer comprising of organic compound 3-(4-biphenylyl)-4-phenyl-5-(4-tert-butylphenyl)-1,2,4-triazole which are polycyclic compounds.

Referring to claim 11, Kido ('199) discloses different organic layers are formed as films by vapor deposition.

Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,858,562 to Utsugi et al. in view of JP 04297076 to Takashi and further in view of U. S. Patent 5,869,199 to Kido('199).

Claims 18 and 19 essentially recite the same limitations of claims 1 and 3. Utsugi et al. and Takashi in view of Kido('199) disclose all the limitations of claims 1 and 3 and

hence claims 18 and 19 are rejected for the same reason (see rejection of claims 1 and 3).

Response to Arguments

Applicant's arguments filed on May 1,2002 have been fully considered but they are not persuasive.

In response to applicants' response that Utsugi and Takashi fail to disclose or suggest the equation required by claim 1 the Examiner respectfully disagrees. Utsugi et al. disclose (column 4 lines 60-67) that the potential barrier layer in contact with the hole transport layer have energy band gap higher than the energy band gap of the hole transport layer and the light emission layer in contact with the potential barrier layer has energy band gap smaller than that of barrier layer. Hence the electron affinity Ea^{A} of the hole transporting layer with the electron acceptor and the electron affinity Ea^{EM} of the light emission layer both are intrinsically greater than (or equal to) electron affinity Ea^{EBL} of the electron injection restriction layer in between.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The U. S. Patent No. 6,121,727 to Kanai et al. discloses the organic compounds forming the electron transporting layer.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R.

Sikha Roy
Patent Examiner
Art Unit 2879

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